

A NEW SPECIES OF SOUTHERN AFRICAN BREVIRAJID SKATE
(CHONDRICHTHYES, BATOIDEI, RAJIDAE)

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(With 5 figures and 1 table)

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CONTENTS

	PAGE
Introduction	253
Description of material	254
Discussion	262
Summary	263
Acknowledgements	263
References	263

INTRODUCTION

In his revision of the southern African Rajidae, Norman (1935) held that the two spinulose juveniles, reported as *Raja plutonia* Garman by Barnard (1925), were specimens of *Raja spinacidermis*, since their dorsal surfaces were entirely covered with small asperities and the enlarged thorns along the midline of the back and tail showed signs of disappearance. Although these specimens were not available to him, Hulley (1970), on the basis of two further specimens (SAM 22911, 24450), tentatively accepted Norman's synonymy. However, he pointed out that, not only are there differences between these specimens and *Raja spinacidermis* in the spination of the orbital region, the shape of the disc and the tail length, but also there were marked differences in the tooth count (36-38 rows in the upper jaw, compared with 54-60 rows in *Raja spinacidermis*).

The Division of Sea Fisheries, Cape Town, has recently collected 15 specimens of these spinulose rajids, during the 1972 Hake Survey, and have donated this material to the South African Museum. Examination of the rostral cartilage and appendices and of the anatomy of the clasper of these specimens reveals that they should be described as a new species, *Breviraja stehmanni*, and as such represent the first record of the genus outside the waters of the western central Atlantic. SAM 24450 can be identified as this species.

The genus *Breviraja* Bigelow & Schroeder, 1948, was constructed to incorporate those rajids having 'the tip of the rostral cartilage falling short of the extremities of the pectoral rays and of tip of snout', diagnostic characters which were based on X-ray photographs. However, Ishiyama & Hubbs (1968) point out that the interpretation of these photographs is erroneous, and that the rostral cartilage is not foreshortened and extends virtually to the tip of the snout, beyond the anterior tips of the pectoral rays. On the basis of the rostral structure and the anatomy of the clasper, Ishiyama & Hubbs (1968) substan-

tiate the validity of *Breviraja* and defined a further genus, *Bathyraja*, confining it to the Pacific. Stehmann (1970) and Hulley (1970, 1972) agree with these findings, but point out that the genus *Bathyraja* also exhibits a discontinuous, antitropical distribution pattern in the Atlantic, while the genus *Breviraja* appears to be confined to slope regions of the western central Atlantic. Furthermore, both Stehmann (1970) and Hulley (1972) have commented on the phylogenetic position of *Breviraja*.

Breviraja stehmanni is separated from all other southern African rajids by the peculiar form of the rostral cartilage and rostral appendices, and is at present the only species of this genus recorded from the region. It may easily be distinguished from all other species of the genus, except *B. plutonia* (Garman) and *B. cubensis* Bigelow & Schroeder, by its long, cross-barred tail and dark dorsal fins. It most closely resembles *B. plutonia* in that the dorsal fins are continuous, but differs markedly from this species in tooth count, length of the anterior lobe of the pelvic fin and number of scapular thorns. In these characters it approximates *B. cubensis*, but may be distinguished from this species by its continuous dorsal fins. Furthermore, *B. stehmanni* differs from both these species in its comparatively larger disc, shorter tail, smaller eye and shorter anterior pelvic lobe, and especially in the presence of a single, median row of larger thorns on the back and tail, which extends to about one-half to two-thirds the length of the tail.

The species is named in honour of Dr M. Stehmann, Institut für Seefischerei, Hamburg.

DESCRIPTION OF MATERIAL

Breviraja stehmanni n. sp.

Raja plutonia: Barnard, 1925: 68.

Raja spinacidermis: Norman, 1935: 46 (*partim*).

?*Raja spinacidermis*: Hulley, 1970: 173, pl. 4, fig. A.

Types

The type, an adult male (354.3 mm total length) and paratype, a female (299.5 mm total length), trawled between 33°53.7'S, 17°23.9'E and 33°57.3'S, 17°22.2'E in 640 m (Division of Sea Fisheries, Station No. A 5854), in the collection of the South African Museum (SAM 26636, 26637).

Material

The type and paratype, and 13 specimens of both sexes (132.5–340.0 mm total length) trawled from two stations, A 5854 (10 April 1972: 33°53.7'S, 17°23.9'E–33°57.3'S, 17°22.2'E; 640 m; bottom temp. 5.55°C) and A 5871 (33°55.6'S, 17°25.0'E–33°56.1'S, 17°26.8'E; 600 m; bottom temp. 5.70°C), and 1 specimen, a female (305 mm total length), trawled west of Cape Town in 160 fms (292 m). All specimens in the collection of South African Museum (SAM 24450, 26638, 26639).



FIG. 1
Breviraja stehmanni n. sp. TYPE. A. Dorsal view. B. Ventral view. Scale 11 cm and in.

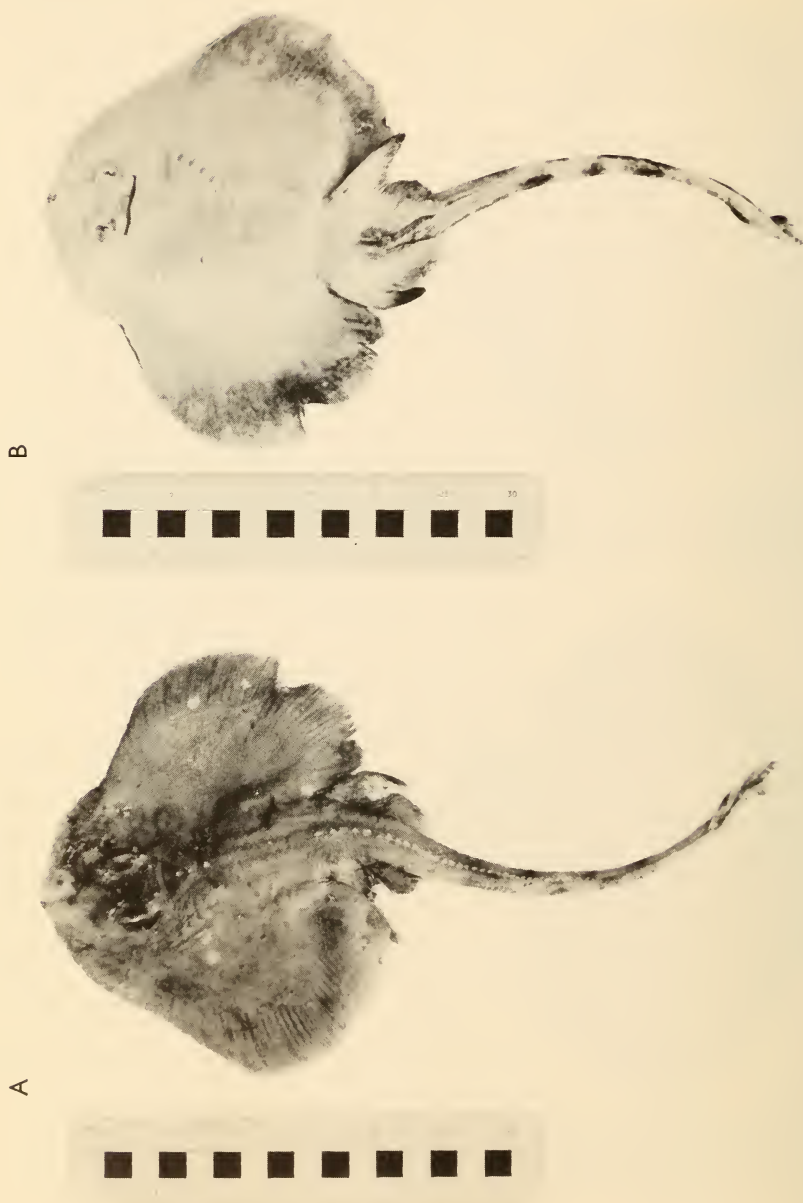
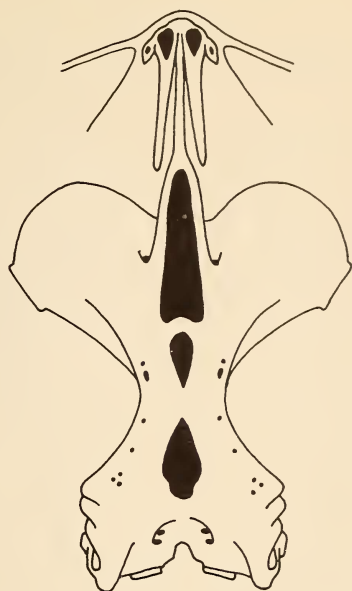


FIG. 2.
Breviraja stehmanni n. sp. PARATYPE. A. Dorsal view. B. Ventral view. Scale in cm and in.



1,0 cm

FIG. 3.

Breviraja stehmanni n. sp. Neurocranium, rostral bar and appendices, and anterior extremities of pectoral rays.

Description

Measurements for the type and paratype, respectively, are given, while the figures in parentheses refer to the range of variation for 14 specimens.

Disc, 1,3; 1,2 (1,2-1,4) times as broad as long, its width 1,8; 1,9 (1,7-1,9) in total length; obtuse in front, tip of snout marked by a low projection, with maximum angle in front of spiracles 123° ; 129° ($115^\circ-130^\circ$); anterior margins slightly concave just behind tip of snout and again at level of spiracles, more strongly so in adult males than in females and juveniles; outer angles broadly rounded, posterior and inner margins strongly convex. Axis of greatest breadth 1,4; 1,5 (1,3-1,7) times as far from tip of snout as from posterior edge of disc. Tail with narrow lateral folds along posterior third; its length from middle of vent to origin of first dorsal fin 1,2; 1,3 (1,1-1,3) times as long as distance from middle of vent to tip of snout.

Entire upper surface of disc and tail with small asperities, except tip of snout, narrow anterior margin of pectoral and anterior lobe of pelvic, and mature males with naked area at pectoral base. Orbit with 4-5 (1-6) thorns at anterior margin, well separated from 3 (1-4) thorns on posterior margin and above spiracle; 1 very small interspiracular thorn on each side in some juveniles;

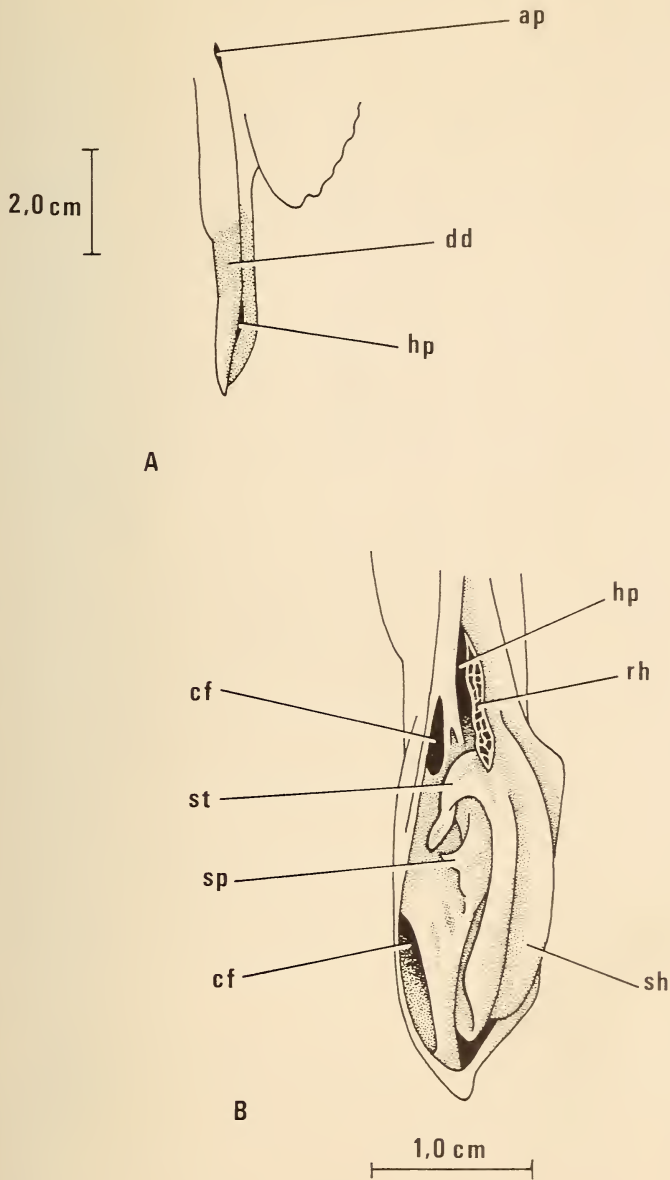


FIG. 4.

Breviraja stehmanni n. sp. A. External view of right clasper from the dorsal side. B. Lateral view of right clasper, opened to show structural features of the glans.

ap—apopyle; cf—cleft; dd—dermal denticles; hp—hypopyle; rh—rhipidion; sh—shield; sp—spike; st—sentinel.

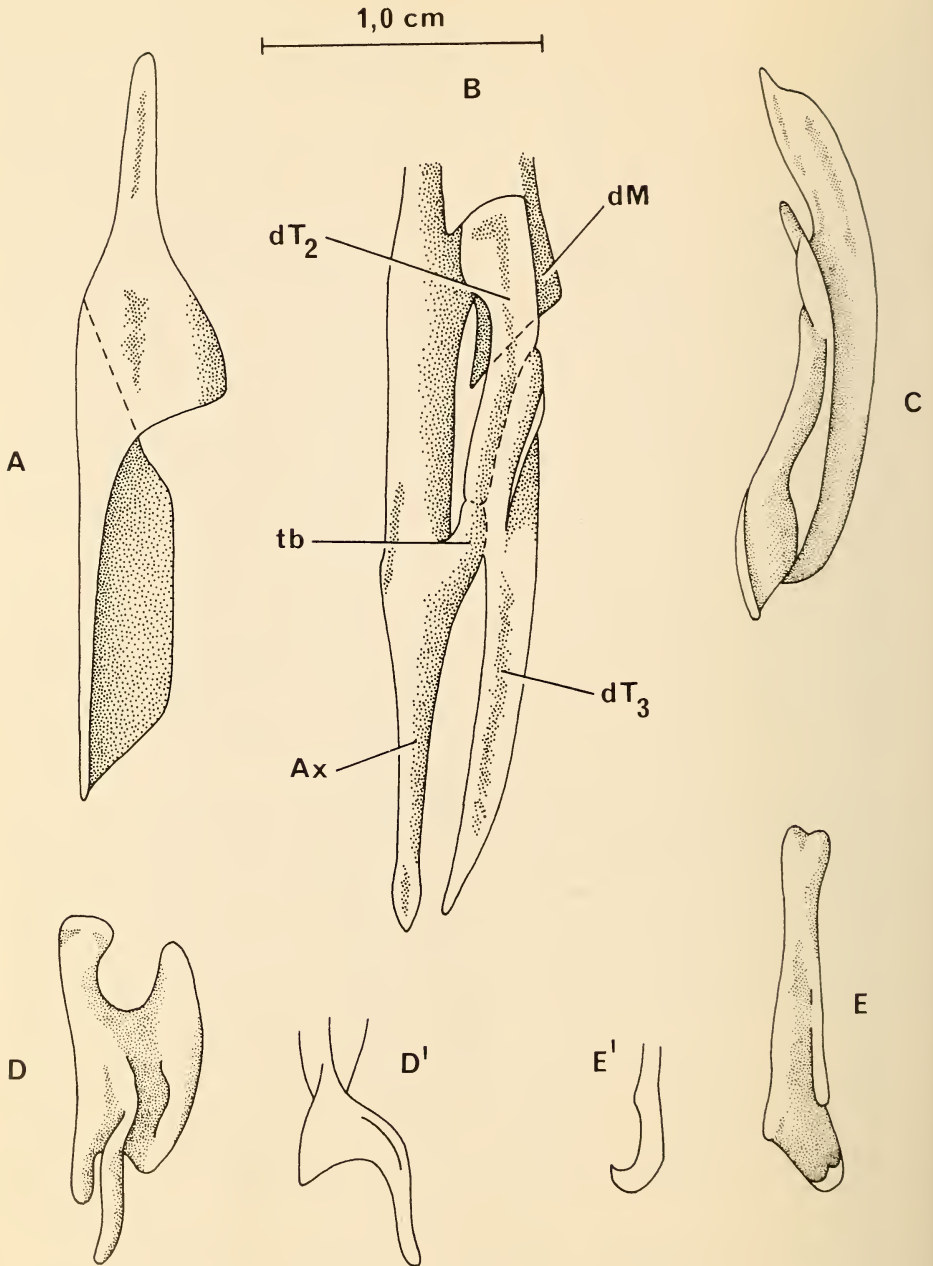


FIG. 5.

Breviraja stehmanni n. sp. Clasper cartilages. A. Dorsal terminal 1 (dorsal view). B. Axial, dorsal marginal, dorsal terminal 2 and 3, and terminal bridge (dorsal view). C. Ventral terminal (dorsal view). D. D¹. Accessory terminal 1 (dorsal and lateral views). E. E¹. Accessory terminal 2 (dorsal and lateral views).

Ax—axial; dM—dorsal marginal; dT₂, dT₃—dorsal terminals 2 and 3; tb—terminal bridge.

teriorly to level of anterior fontanelle, well separated from rostral bar; anterior notch bridged with a thin cartilaginous connection; small additional appendix on each side, with a foramen; radial cartilages of pectorals extending anteriorly almost to appendices; anterior fontanelle well developed, with anteriorly arched epiphysial bridge; 2 (sometimes 1) posterior fontanelles; orbito-nasal canal foramen comparatively small, anterior cerebral vein foramen above level of optic foramen.

Mouth weakly arched medially; nasal curtain fringed. Teeth arranged in 41, 39 (38-44) rows in upper jaw, blunt and flat and in quincunx in females and juveniles, but adult males with laterally directed, long, conical points in centre of jaw.

Anterior lobes of pelvics fin-like and continuously connected with posterior lobes along outer margin of fin; anterior margin of pelvic about 70%, 78% (68-84%) as long as distance from its own origin to rear tip of pelvic.

Dorsal fins similar in shape and about similar in size, confluent at base; caudal membrane posterior to second dorsal about half as long as base of second dorsal.

Vertebral count: Vtr 26; 26 (24-26); Vprd 69; 71 (65-74); VΣ 95; 97 (91-98).

Claspers pointed; pseudosiphon absent; dermal denticles present on dorsal border and ventral surface; inner dorsal lobe with two clefts separated by terminal bridge; rhipidion fan-shaped and situated at hypopyle; shield well-developed; laterally projecting sentinel and recurved spike situated medially. Axial cartilage pointed terminally; dorsal marginal with short distal extension, ventral marginal distally arched; dorsal terminal 1 cartilage with proximal extension; dorsal terminal 2 and 3 cartilages simple and forming dorsal lobe framework; ventral terminal cartilage with dorsally convex, outer, lateral margin and with anterior notch at about one-third the length of the cartilage from the proximal end; accessory terminal 1 cartilage U-shaped proximally and with well developed Z-shaped lateral projection; accessory terminal 2 simple, with hooked, spatula-like distal extremity, closely attached to axial cartilage along its inner lateral margin.

Colour

Upper surface of disc greyish, skin at bases of prickles and at rear sides of larger thorns not especially pigmented; disc with irregular darker blotches and scattered paler spots; tail with 6-7 irregular, dark crossbars, either continuous across dorsal surface or interrupted, the two most posterior crossbars nearly black and passing through first and second dorsal fins. Lower surface of disc pale but tip of snout with black spot; thin darker areas along anterior margin of pectoral, wider along posterior margins and margins of pelvics; dusky, irregular areas sometimes between nostrils, around mouth, between gills and on belly; tail with dark crossbars encroaching from sides of tail, but mature specimens with ventral surface of tail somewhat darker mottled in a few cases.

Size

Males mature at about a length of 340 mm, as ascertained from the degree of calcification of the clasper cartilages and the presence of well developed malar and alar spines. Females probably reach a slightly greater size at sexual maturity.

Distribution

South of Agulhas Bank to west of Cape Town in 292–1 025 metres.

DISCUSSION

As has been pointed out, the genus *Breviraja* was previously thought to be confined to the edges of the continental shelf and upper regions of the slope in the western central Atlantic (Bigelow & Schroeder 1953; Stehmann 1970; Hulley 1972) in depths of 200–727 fms (366–1 329 m). *Breviraja stehmanni*, which is so far known only from the eastern South Atlantic, west of Cape Town, appears to have a similar depth distribution, 160–560 fms (292–1 025 m). Bottom temperatures at this depth and in this region may vary between 3°C and 8°C (Hulley 1972). The species may be more widely distributed in the southern African region and may not be confined only to the Atlantic, since bottom temperatures are more or less uniform at depths greater than 100 m, both east and west of Cape Point. Hulley (1972) has pointed out that the majority of species are widely distributed throughout the entire southern African region.

An association of *Breviraja* with the *Dipturus*-line of evolution (Hulley 1972) appears to be substantiated by the anatomy of the claspers and neurocranium of *Breviraja stehmanni*. The dorsal position of the foramen of the anterior cerebral vein and the general arrangement of the clasper, especially the well developed rhipidion, lack of a proximal shelf on the dT₁ and well developed vT, suggest an association with the *Dipturus*/*Amblyraja*/*Leucoraja*/*Rajella*-line rather than with the *Bathyraja*/*Raja*/*Rostroraja*-line (Hulley 1972: fig. 56).

Breviraja might be considered to be ancestral to both the *Dipturus*- and the *Amblyraja*/*Leucoraja*/*Rajella*-lines of evolution, since the predorsal caudal vertebral count is high and the clasper exhibits primitive characteristics in the retention of dermal denticles, a pointed distal tip to the Ax cartilage and the well developed Z-shaped lateral projection of aT₁ (Fig. 5; Ishiyama & Hubbs 1968: fig. 2). However, the lack of an external pseudosiphon, arrangement of the dT₂ and dT₃ cartilages and the more proximal position of the anterior notch on the vT, point to a closer association with the *Dipturus*-line. The development of a thin rostral bar, without anterior grooving, and of the characteristic rostral appendages, indicate a specialized condition for the genus. It may therefore be concluded that the genus *Breviraja* represents a very early split from the *Dipturus*-line, which penetrated somewhat deeper regions and retained the neotonous condition of the snout as an increased advantage in grubbing.

SUMMARY

A new species of southern African skate, *Breviraja stehmanni*, is described and represents the first record of the genus outside the waters of the western central Atlantic. The phylogenetic position of *Breviraja* is briefly discussed.

ACKNOWLEDGEMENTS

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REFERENCES

- BARNARD, K. H. 1925. A monograph of the marine fishes of South Africa. *Ann. S. Afr. Mus.* **21**: 1-418.
- BIGELOW, H. B. & SCHROEDER, W. C. 1948. New genera and species of batoid fishes. *J. mar. Res.* **7**: 543-566.
- BIGELOW, H. B. & SCHROEDER, W. C. 1953. Fishes of the western North Atlantic. Part 2. Sawfishes, guitarfishes, skates and rays. Chimaeroids. *Mem. Sears Fdn mar. Res.* **1** (2): i-xv, 1-588.
- HULLEY, P. A. 1970. An investigation of the Rajidae of the west and south coasts of southern Africa. *Ann. S. Afr. Mus.* **55**: 151-220.
- HULLEY, P. A. 1972. The origin, interrelationship and distribution of southern African Rajidae (Chondrichthyes, Batoidei). *Ann. S. Afr. Mus.* **60**: 1-103.
- ISHIYAMA, R. & HUBBS, C. L. 1968. *Bathyraja*, a new genus of Pacific skates (Rajidae) regarded as phyletically distinct from the Atlantic genus *Breviraja*. *Copeia* **1968**: 407-410.
- NORMAN, J. R. 1935. Coast fishes. Part I. The South Atlantic. 'Discovery' *Rep.* **12**: 1-58.
- STEHMANN, M. 1970. Vergleichend morphologische und anatomische Untersuchungen zur Neuordnung der Systematik der nordostatlantischen Rajidae (Chondrichthyes, Batoidei). *Arch. Fisch. Wiss.* **21**: 73-164.